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UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
PLANT PEST CONTROL BRANCH

MANUAL OF APPROVED TREATMENT PROCEDURES
TO BE USED UNDER THE MEDITERRANEAN FRUIT FLY QUARANTINE

Introductory Note

The Federal domestic Mediterranean fruit fly quarantine which became effective May 16, 1956 provides in Sec. 301.78-5 that certificates or limited permits may be issued for interstate movement of regulated articles designated in Sec. 301.78-3 when they have been treated under the observation of an authorized inspector and in accordance with methods selected by him from administratively authorized procedures known to be effective under the conditions in which applied.

For that purpose the attached procedures for the treatment of regulated articles enumerated in Sec. 301.78-3 of the quarantine are administratively authorized by the Chief of the Plant Pest Control Branch of the Agricultural Research Service.

The chemicals (ethylene dibromide and methyl bromide) authorized for the fumigation of regulated articles are dangerous, and certain precautions must be taken in handling them. The facts relative to these chemicals must be brought to the attention of some responsible person concerned with treatment of infested products before the treatment is applied.

CAUTION--Ethylene dibromide and methyl bromide are gases as applied in fumigation. They are colorless and practically odorless in concentrations used for fumigation of regulated articles. Fumigation chambers should be freed of gas before entering them. The methods of applying these gases provide a closed system in which the operator is not exposed to a dangerous concentration of gas, provided there is no leakage in any exposed portion of the system. Extreme care should be exercised to keep all connections of such apparatus tight and to promptly replace defective parts to prevent accidents. Operators should avoid getting any liquid ethylene dibromide or methyl bromide on their clothing or bodies at any time. Information as to additional precautions to be taken is available upon request.

Disclaimer--The following clause should be brought to the attention of owners of regulated products which are to be treated:



9.15.10

"In authorizing these treatments as a basis for certification of regulated articles, it is understood that no liability shall attach either to the United States Department of Agriculture or to any of its employees in the event of injury to the regulated products or to the operators."

All costs incident to the treatment of regulated products shall be at the expense of the owner of the regulated articles except that there will be no charge for the services of the Federal or state inspector observing the treatment.

Date September 27, 1956



Chief, Plant Pest Control Branch

CONTENTS

	Page No.
Treatment of Host Fruits and Vegetables with Ethylene Dibromide.	1
Treatment of Host Vegetables with Methyl Bromide.	3
Treatment of Host Fruits and Vegetables with Vapor-Heat Method	4
Treatment of Host Fruits with Low Temperatures.	6
Movement of Fruits and Vegetables Following Specified Spray Schedules	8
Surface Application of Dieldrin or Heptachlor to Nurseries as a Basis for Certification of Nursery Stock .	11

TREATMENT OF HOST FRUITS AND VEGETABLES WITH ETHYLENE DIBROMIDE

The following method is approved for treatment of host fruits and vegetables with ethylene dibromide to meet the requirements of the regulations supplemental to the Mediterranean fruit fly quarantine.

A. Host fruits and vegetables

The following fruits may be treated by this method:

1. All citrus
2. Avocados
3. Cantaloupes
4. Cucumbers
5. Guavas
6. Litchi
7. Mangoes
8. Papayas
9. Pineapples

B. Ethylene dibromide fumigation

This treatment shall consist of fumigation with vaporized ethylene dibromide at normal atmospheric pressure under conditions approved by the inspector at the dosages prescribed. Fumigation chambers should not be filled to more than two-thirds capacity with fruit and the boxes or containers should not be stacked ceiling high since a portion of the unfilled space should be in the upper part of the chamber. Air circulation shall be maintained throughout the exposure period. Unless hereinafter provided fruit cannot be fumigated after it has been waxed or individually wrapped.

This approved treatment shall consist of fumigation of the fruits and vegetables shown above with vaporized ethylene dibromide at normal atmospheric pressure at the dosages and fruit and air temperatures shown under (a) and (b) below unless specifically shown otherwise under 1, 2 or 3 below.

(a) 8 ounces of ethylene dibromide per 1,000 cubic feet of space for 2 hours at temperatures (both fruit and fumigation chamber) of 77° F. or above.

(b) 10 ounces of ethylene dibromide per 1,000 cubic feet of space for 2 hours at temperatures (both fruit and fumigation chamber) of 70° F. to 76° F. inclusive.

1. Avocados (Pollock variety). Avocados of the Pollock variety only may be fumigated with 10 ounces ethylene dibromide per 1,000 cubic feet of space for 2 hours at 70° F. or above.
2. Prepacked papayas and mangoes. (1) Papayas and mangoes prepacked for shipment may be fumigated in an atmospheric fumigation chamber approved for this purpose for a period of two hours at a minimum temperature of 70° F. with a dosage of 1½ pounds of ethylene dibromide per 1,000 cubic feet of space, including the load. (2) The fruit may be individually wrapped in tissue paper, or packed in shredded paper or wood excelsior, in unlined corrugated cartons and sealed along the central flap with Kraft paper tape. No additional covering or lining for the cartons is authorized. (3) Narrow wooden strips should be placed between the containers.
3. Pineapples in corrugated collars. Pineapples in corrugated paper collars, packed in unlined, well-aerated crates may be fumigated in an approved atmospheric fumigation chamber for a period of three hours at a minimum temperature of 70° F. with a dosage of three-quarters pound of ethylene dibromide per 1,000 cubic feet of space, including the load.

No specifications as to the exact methods and equipment used in obtaining the required temperatures, volatilizing and circulating the gas, are prescribed but the conditions under which fumigation takes place must be satisfactory to the supervising inspector. Extreme care must be taken to prevent the escape of gas into the packing plant during the fumigation process as ethylene dibromide gas is toxic to human beings.

C. Department not responsible for damage

While the results of the fruit treatment experiments so far conducted have been successful, it should be emphasized that inexactness and carelessness in operation may result in injury to fruit. In approving the method of treatment specified above, the United States Department of Agriculture does not accept the responsibility for fruit injury.

TREATMENT OF HOST VEGETABLES
WITH METHYL BROMIDE

The following method is approved for treatment of host vegetables with methyl bromide to meet the requirements of the regulations supplemental to the Mediterranean fruit fly quarantine.

A. Host vegetables

The following vegetables may be treated by this method:

1. Bell peppers
2. Cucumbers
3. Pink and red ripe tomatoes

B. Methyl bromide fumigation

This treatment shall consist of fumigation of the vegetables with vaporized methyl bromide at atmospheric pressure at the dosage of 2 pounds methyl bromide per 1,000 cubic feet of space for $3\frac{1}{2}$ hours at temperatures of 80° F. or above. Fumigation chambers should not be filled to more than two-thirds capacity with fruit and the boxes or containers should not be stacked ceiling high since a portion of the unfilled space should be in the upper part of the chamber. Air circulation shall be operated for 15 minutes after all the gas has been vaporized.

C. Department not responsible for damage

While the results of the vegetable treatment experiments so far conducted have been successful, it should be emphasized that inexactness and carelessness in operation may result in injury to vegetables. In approving the method of treatment specified above, the United States Department of Agriculture does not accept the responsibility for vegetable injury.

TREATMENT OF HOST FRUITS AND VEGETABLES
WITH VAPOR-HEAT METHOD

The following method is approved for treatment of host fruits and vegetables with vapor-heat to meet the requirements of the regulations supplemental to the Mediterranean fruit fly quarantine.

A. Host fruits and vegetables

The following fruits and vegetables may be treated by this method:

1. All citrus
2. Mangoes
3. Papayas
4. Pineapples
5. Bell peppers
6. Eggplants

B. Vapor-heat treatment

1. The temperature of the fruit shall be raised to 110° F., at the approximate center of the fruit, within a period of 8 hours and shall be held at that level during the following 8-3/4 hours. This method is adapted to sterilization plants that do not have the capacity to increase the temperature of the fruit steeply at the beginning of the treating period.
2. In the approved vapor-heat "quick-run-up" treatment the fruits and vegetables are heated by saturated vapor until the temperature at the approximate center of the product reaches a minimum of 117° F.

While no specifications as to the exact methods and equipment for obtaining these conditions are prescribed, the air within the room shall be maintained at the temperature and under the humidity conditions required by the supervising inspector. Available information clearly indicates that by the application of dry heat the required temperatures cannot be reached without injury to the fruit. To prevent such injury and to insure effective mortality complete saturation of the atmosphere is necessary. In the tests where successful performance was obtained, live steam as the source of heat was applied in such a way as to secure as nearly as possible a uniform distribution of steam-heated air so directed as not to discharge directly on the fruit. The fruit was held in field boxes stacked six boxes high and without special means of separating the boxes in each stack. The experiments indicate that the

fruit should be sterilized after coloring, if this is necessary, and before packing for shipment, and then cooled down to a temperature around 45° F., as soon as possible after sterilizing. Wax or paraffin, either dry or in solution, should not be applied to this fruit before sterilization.

Eggplants require conditioning before they will tolerate the approved vapor-heat treatment. Even when conditioned, darkening of their seeds usually occurs. In tests of eggplant tolerance to vapor-heat treatment, 6 to 8 hours conditioning at 110° F. and approximately 40 percent relative humidity before the prescribed 8-3/4 hour holding period has been found effective. This conditioning procedure or any other that the shipper has developed and found satisfactory may be used for eggplants at the shipper's risk.

Papayas require conditioning before they will tolerate the approved vapor-heat "quick run-up" treatment and even then some injury may result. Any conditioning that the shipper has developed and found satisfactory may be used with the "quick run-up" treatment for papayas at the shipper's risk.

C. Department not responsible for damage

While the results of the fruit and vegetable treatment experiments so far conducted have been successful, it should be emphasized that inexactness and carelessness in operation may result in injury to fruit or vegetables. In approving the method of treatment specified above, the United States Department of Agriculture does not accept the responsibility for fruit or vegetable injury.

TREATMENT OF HOST FRUITS
WITH LOW TEMPERATURE

The following method is approved for treatment of host fruits with low temperatures to meet the requirements of the regulations supplemental to the Mediterranean fruit fly quarantine.

A. Host fruits

The following fruits may be treated by this method:

1. All citrus
2. Mangoes

B. Low temperature method

1. Phases of treatments. The cold treatment shall consist of (a) precooling during which the fruit shall be cooled until its pulp temperature is at or below a level designated in or under this paragraph and (b) refrigeration, during which the fruit shall be held at or below this level for a number of days designated in or under this paragraph.
2. Refrigeration temperatures and periods. Fruit cold treated because of the Mediterranean fruit fly shall be refrigerated for one of the following periods at or below the respective temperature designated:

10 days --	32° F.
11 days --	33° F.
12 days --	34° F.
14 days --	35° F.
16 days --	36° F.

3. Other conditions

These treatments may be conducted only in refrigeration plants that are approved by the Plant Pest Control Branch. The Branch will approve only those plants that are adequately equipped to handle and sterilize fruit. Such treatment will be done under the supervision of inspectors of the Branch. These inspectors shall at all times be given access to fruit while in the process of treatment.

C. Department not responsible for damage

While the results of the fruit treatment experiments so far conducted have been successful, it should be emphasized that inexactness and carelessness in operation may result in injury to fruit. In approving the method of treatment specified above the United States Department of Agriculture does not accept the responsibility for fruit injury.

MOVEMENT OF FRUITS AND VEGETABLES FOLLOWING
SPECIFIED SPRAYING SCHEDULES

The following methods and materials are acceptable for the handling of host fruits and vegetables to meet the requirements of the regulations supplemental to the Mediterranean fruit fly quarantine, when applied by the grower under the supervision of Mediterranean fruit fly program personnel:

A. Host fruits and vegetables

1. Avocados
2. Bell peppers
3. Cantaloupes
4. Cucumbers
5. Eggplants
6. Pink and ripe tomatoes (destined to designated northern markets)

B. Malathion or parathion* sprays

A combination of insecticide and insecticide-bait treatments of field and grove crops and environs, together with wild host plant removal and/or removal of host fruits in the field environs as outlined by an inspector, may be used as a basis for the movement of fruit and vegetables listed under "A." Malathion or parathion will be applied to the grove or field crop and its environs in conformance with the following specifications:

1. Field crops and environs

(a) Field crops. In the treatment of field crops the insecticides will be applied as emulsions or suspensions at rates of not less than 0.5 pound of malathion or 0.15 pound of parathion per acre per application. Spraying operations will begin at the time when, in the judgment of the inspector, the maturity of the crop makes it susceptible to infestation by the Mediterranean fruit fly. Spray applications will be repeated at weekly intervals, or as may be required by the inspector, and discontinued prior to harvest in conformance with the instructions on the label of the insecticide being used.

(b) Field environs. Bait-sprays consisting of a bait (protein hydrolysate) and an insecticide (malathion or parathion) will be applied at the rate of not less than 0.5 pound of actual malathion or parathion per acre per treatment. The formulations of these sprays shall be made only from wettable powder insecticides. The field environs are defined as areas of not less than 100 feet in width surrounding the treated field crop as outlined by the inspector. The first application of bait-sprays to the environs will coincide with the time of the first application to the field crop and be repeated at 10-day intervals until such time as the inspector may designate.

(c) Scope of treated areas. All treatments, as outlined in (a) and (b) above, must be made on an area or community-wide basis, as designated by the inspector, so that all host crops and their environs will be effectively treated. Otherwise, no crop produced within a regulated area will qualify for movement without fumigation.

(d) Wild host plants. Wild guava plants, within 300 feet of treated field crops, must be destroyed by felling, herbiciding, or such other method approved by the inspector. Fruits of other host plants within 300 feet of treated field crops must be removed and destroyed. The removal of wild guava plants and of host fruits will be mandatory during the entire growing season of the field crop.

2. Fruits

(a) Avocados. Bait-sprays, consisting of bait (Protein hydrolysate) and an insecticide (malathion or parathion), are acceptable as a precautionary measure in the treatment of avocados in areas where the results of these sprays and associated control operations make the safe movement of avocados possible. The malathion or parathion, in the form of wettable powders only, shall be applied in a bait spray at the rate of 0.5 pound actual insecticide per acre per application. Spray applications to the avocado grove and its prescribed environs will begin at a time when, in the judgment of the inspector, the maturity of the crop makes it susceptible to infestation by the Mediterranean fruit fly. Spray

applications will be repeated at 10-day intervals, or as required by the inspector, and be discontinued prior to harvest in compliance with instructions on the label of the insecticide used.

*Parathion is highly poisonous to human beings if inhaled, absorbed through the skin, or swallowed. Extreme care must be exercised at all times in handling or using this product. Parathion, although very effective, is not recommended for the control of the Mediterranean fruit fly. However, where the grower elects he may use parathion, in preference to malathion, such usage is acceptable on regulated articles when applied in conformance with the above instructions. Inspectors should be warned against entering a field too soon after the crop has been sprayed with parathion.

SURFACE APPLICATION OF DIELDRIN OR HEPTACHLOR TO NURSERIES
AS A BASIS FOR CERTIFICATION OF NURSERY STOCK
SUBJECT TO MEDITERRANEAN FRUIT FLY QUARANTINE

Surface applications of dieldrin or heptachlor are approved for use in connection with the Mediterranean fruit fly eradication program for the following purpose and under the following conditions:

These treatments, when applied under the supervision of Mediterranean fruit fly eradication personnel, will serve as a basis for the certification of nursery stock.

- A. Materials: Dieldrin or heptachlor
- B. Dosage: 5 pounds per acre
- C. Formulations: Containing 10 percent dieldrin or heptachlor, 30 - 40 mesh
- D. Method of treatment: The dieldrin or heptachlor must be applied uniformly to the entire surface of the land to be treated.
- E. Time of application: When the dieldrin or heptachlor is applied between May 1 and August 31 the plants produced therein are eligible for certification 30 days following the date of application, provided that approved foliage treatments are applied at the dosage and intervals recommended by an authorized Mediterranean fruit fly inspector to the nursery and such environs area as may be outlined, and the removal of any host fruit present has carried on concurrently with the application of bait sprays and continued as long as the area is classified as infested.

